Patent Claims:

1. Process for the partial thermochemical vacuum treatment of metallic workpieces (1), in particular for the carburization and case-hardening of workpieces (1) of case-hardening steel in a carbon-containing atmosphere, wherein surface regions (3, 4, 5, 6) to be treated and surface regions not to be treated abut one another, and wherein the surface regions not to be treated are covered during the treatment of the remaining surface regions (3, 4, 5, 6) by reusable mould bodies (11) of a temperature-resistant material, characterised in that for the simultaneous treatment of several workpieces (1) with defined cavities (2) the workpieces (1) are installed in a mould body (11) having at least one mould cavity (15) and several openings (12b, 13b) through which the carbon-containing atmosphere enters the cavities (2) of the workpieces (1), in which the mould body (11) encloses the workpieces (1) in such a way that no thermochemical treatment takes place on the external surface regions of the said workpieces (1).

2. Process according to claim 1, characterised in that in each case at least one surface region of the cavity (2) of the workpiece (1) is screened by means of an inserted sleeve (8) against a thermochemical treatment, whereas at least one further surface region (3, 4, 5) of the cavity (2) is subjected to the thermochemical treatment.

3. Process according to claim 1, characterised in that the thermochemical treatment is carried out under the

action of a plasma and that the mould body (11) consists of an electrically conducting material.

4. Process according to claim 1, characterised in that a mould body (11) having a plurality of mould cavities (15) is used for receiving in each case one workpiece (1).

5. Process according to claim 1, characterised in that the mould body (11) is formed as a housing with an upper part (13) and that at least the upper part (13) has openings (13b) that communicate with the cavities (2) in the workpieces (1) and through which the carbon-containing atmosphere enters the said workpieces (1).

6. Process according to claim 1, characterised in that between the surface regions not being treated of the workpieces (1) and the mould body (11) sleeves (7, 8) are employed for sealing purposes.

7. Process according to claim 1, characterised in that a plurality of mould bodies (11) are combined to form a batch (17).

8. Process according to claim 1, characterised in that the process is carried out in a vacuum range between 10 Pa and 3000 Pa, preferably between 50 Pa and 1000 Pa.

9. Process according to claim 2, characterised in that the process is carried out with plasma voltages of

between 200 and 2000 volts, preferably between 300 and 1000 volts.

10. Process according to claim 9, characterised in that the plasma is used in pulsed form.

11. Process according to claim 10, characterised in that the connection time is between 10 and 200 μs and the pause time is between 10 and 500 μs.

12. Process according to claim 1, characterised in that the carbon-containing gas is at least one hydrocarbon selected from the group comprising methane, ethane, propane and acetylene.

13. Process according to claim 12, characterised in that at least one gas from the group comprising argon, nitrogen and hydrogen is added to the carbon-containing gas, the proportion of the at least one hydrocarbon being chosen between 10 and 90 vol. %.

14. Process according to claim 1, characterised in that graphite is used as material for the mould bodies (11).

15. Process according to claim 1, characterised in that CFC is used as material for the mould bodies (11).

16. Process according to claim 1, characterised in that a material that does not exhibit any distortion phenomena at least up to a temperature of 1050°C,

preferably up to 1200°C, is used as material for the mould bodies (11).

17. Process according to claim 3, characterised in that the plasma-side ends of the at least one mould cavity (15) of the mould bodies (11) are formed in a plasma-tight manner opposite the respective workpiece (1).

18. Process according to claim 1, characterised in that the workpieces (1) within the mould body (11) are subjected to a heating procedure before the carburization.

19. Process according to claim 1, characterised in that the workpieces (1) within the mould body (11) are subjected to a diffusion procedure after the carburization.

20. Process according to claim 1, characterised in that the workpieces (1) within the mould body (11) are subjected to a high pressure gas quenching after the diffusion procedure.

21. Process according to claim 1, characterised in that the workpieces (1) within the mould body (11) are subjected after the high pressure gas quenching to at least one further treatment from the group consisting of deep cooling and annealing.

22. Apparatus for use in a single-chamber unit or in a multi-chamber throughflow unit for the partial thermochemical vacuum treatment of metallic workpieces

(1), in particular for the carburization and case-hardening of workpieces (1) of case-hardening steel in a carbon-containing atmosphere, wherein surface regions (3, 4, 5, 6) to be treated and surface regions not to be treated abut one another, and at least one reusable mould body (11) that consists of a temperature-resistant material is provided to cover surface regions not to be treated during the treatment of the remaining surface regions (3, 4, 5, 6), characterised in that in the mould body (11) several mould cavities (15) are provided for the insertion of several workpieces (1), wherein the workpieces (1) can be enclosed in the mould cavity (15) in such a way that no thermochemical treatment takes place on the external surfaces of the workpieces (1).

23. Apparatus according to claim 22, characterised in that the mould body (11) is formed as a housing and consists of an electrically conducting material and that the workpieces (1) can be enclosed in the mould cavity (15) in such a way that when using a plasma no plasma is formed between the mould body (11) and the workpieces (1).

24. Apparatus according to claim 22, characterised in that the mould body (11) for the treatment of the workpieces (1) with cavities (2) that are subjected to a thermochemical vacuum treatment has several openings (12b, 13b) that communicate with the cavities (2) of the in each case associated workpieces (1).

25. Apparatus according to claim 22, characterised in that the mould body (11) is formed as a housing with an

upper part (13), and that at least the upper part (13) has several openings (13b) that communicate with the cavities (2) in the in each case associated workpieces (1).

26. Apparatus according to claim 25, characterised in that the mould body (11) comprises a lower part (12) that has several openings (12b), and that the axes of the openings (13a, 12a) in the upper part (13) and in the lower part (12) coincide.

27. Apparatus according to claim 26, characterised in that between the lower part (12) and upper part (13) of the mould body (11) there is arranged a separating groove (14) running along the circumference, which permits a telescopic movement between the lower part (12) and upper part (13).

28. Apparatus according to claim 23, characterised in that the plasma-side ends of the openings (12b, 13b) in the mould body (11) opposite the respective workpiece (1) are formed in a plasma-tight manner.

29. Apparatus according to at least one of claims 22 to 28, characterised by sleeves (7, 8) that can be inserted between the workpiece (1) and the lower part (12) on the one hand and between the workpiece (1) and the upper part (13) on the other hand, and which match the workpiece (1) in such a way that surface regions of the workpieces (1) not being treated are excluded from the thermochemical treatment.

30. Apparatus according to claim 22, characterised in that a plurality of mould bodies (11) are combined by means of a transporting frame (16) to form a batch (17).

31. Apparatus according to claim 30, characterised in that the transporting frame (16) comprises crosspieces (18) for arranging mould bodies (11) next to one another and on top of one another.

32. Apparatus according to claim 22, characterised in that the mould body (11) consists of graphite.

33. Apparatus according to claim 22, characterised in that the mould body (11) consists of CFC.

34. Apparatus according to claim 22, characterised in that as material for the mould bodies (11) a material is used that does not exhibit any distortion phenomena at least up to a temperature of 1050°C, preferably up to 1200°C.

35. Apparatus according to claim 23, characterised in that the mould body (11) is arranged within an evacuable chamber (22) with an inlet for at least one hydrocarbon and is connected as a cathode for the formation of a plasma.